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PESTICIDES IN ONTARIO MUNICIPAL DRINKING WATER FROM SURFACE SOURCES 1988

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1988

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SEPTEMBER 1990

RECYCLABLE

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EXECUTIVE SUMMARY

This report presents the results of monitoring for pesticide residues at a limited number of municipal surface water treatment supplies, in 1988. It is comprised of a composite of analytical data from three sources: the Ministry of the Environment (MOE) 1988 pesticide monitoring program and Drinking Water Surveillance Program (DWSP), and the Ontario Ministry of Agriculture and Food (OMAF).

The 1988 pesticide monitoring program was conducted as a follow-up to the 1985 and 1986 MOE pesticide studies. These earlier studies examined the extent to which surface waters and groundwaters, used for municipal and private drinking water, were contaminated by the application of pesticides to agricultural land.

A monitoring program specifically for the detection of pesticides in municipal drinking water, from surface sources, was not conducted by the MOE in 1987. However, pesticide information from DWSP and OMAF has been documented in a separate report entitled Pesticides in Ontario Municipal Drinking Water from Surface Sources, 1987.

In 1988, ten municipal waterworks were sampled for pesticides. Sample locations were selected as being the water supplies most likely to contain pesticide contamination, based on past results.

Thirteen pesticide compounds: alachlor, ametryne, atratone, atrazine, d-ethyl atrazine, cyanazine, metolachlor, prometone, prometryne, propazine, metribuzin (Sencor), simazine, and d-ethyl simazine, were analyzed. Guidelines have been set for all but one compound (atratone) by Health and Welfare Canada (H&WC), or the U.S. Environmental Protection Agency (EPA).

Analysis results indicated that atrazine, d-ethyl atrazine, cyanazine, metolachlor, Sencor, and d-ethyl simazine were detected in samples of raw and treated water.

Atrazine was the most common pesticide reported. It was found at eight locations and was detected in 40 percent of the raw and treated water samples. Concentrations of atrazine ranged from 0.07 to 13.0 ug/L in the raw water and from 0.06 to 7.97 ug/L in the

treated water. D-ethyl atrazine was present in 47 percent of the samples containing atrazine. The maximum concentration of d-ethyl atrazine, detected in the treated water, was 1.53 ug/L. The H&WC Interim Maximum Acceptable Concentration (IMAC) of 60 ug/L, for atrazine and d-ethyl atrazine in drinking water, was not exceeded.

The other pesticides were detected less frequently than atrazine. Nevertheless, when they were found, atrazine was always present. Cyanazine was detected at three locations at concentrations ranging from 0.31 ug/L to 1.3 ug/L in the raw water and from 0.17 to 1.02 ug/L in the treated water. The H&WC IMAC of 10 ug/L was not exceeded. Metolachlor was detected at four locations. The concentrations, ranging from 0.19 to 7.7 ug/L in the raw water and from 0.17 ug/L to 4.75 ug/L in the treated water, were lower than the H&WC IMAC of 50 ug/L. Even though simazine was not found at any of the locations, d-ethyl simazine was detected at trace levels in three samples at two locations. Sencor was detected in three samples at one location. The maximum concentration of Sencor in the raw and treated water was 0.68 ug/L and 1.3 ug/L respectively, well below the H&WC Maximum Acceptable Concentration (MAC) of 80 ug/L.

The 1988 results show that, in general, the number of pesticide occurrences and the levels at which they were found, at the selected surface water treatment plants, were similar to the levels detected in 1987, and lower than those reported in the 1985 and 1986 surveys.

Powdered activated carbon (PAC), used at dosages for taste and odour control (lower than recommended for pesticide control), did not effectively reduce pesticide levels.

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1.0 CONCLUSIONS

(1) Treated water: No pesticide concentration exceeded the applicable drinking water guideline value.

(2) Raw water: No pesticide concentration was higher than the applicable drinking water guideline value.

(3) Pesticide residues were detected in the treated water at 70 percent of the selected municipal waterworks.

(4) Atrazine was the most frequently detected pesticide, and was found in 40 percent of the treated water samples. The highest concentration reported was less than 15 percent of the H&WC IMAC.

(5) In general, the level of pesticide residues detected were similar to the levels detected by monitoring in 1987.

(6) Most locations showed a significant decrease in the number of pesticide occurrences, and the concentrations at which they were found, from the 1985 and 1986 MOE surveys. This may be due to a decrease in the use of triazine herbicides and the climate conditions of higher than normal summer temperatures.

(7) The pesticides that were not detected are probably being used in relatively small quantities, or not at all, at the locations studied.

(8) Powdered activated carbon (PAC), applied at the water treatment plants at dosages lower than recommended for pesticide control, did not effectively reduce the level of pesticide residues.

2.0 RECOMMENDATIONS

The recommendations resulting from this limited program are much the same as those derived from the 1986 and 1987 pesticide surveys:

(1) Monitoring of raw water for pesticides should be conducted during the spring and summer when peak concentrations would be expected.

(2) Monitoring should be conducted on a weekly basis at least during the peak period at those waterworks where pesticide residues were found regularly.

(3) Proper PAC facilities for storage and feeding may be necessary at waterworks where pesticide residues are often found.

(4) PAC dosage should be increased from levels sufficient to treat taste and odour (up to 5 mg/L) to as much as 40 to 50 mg/L, during and immediately following heavy rainfall to ensure optimum removal of pesticides from treated water.

3.0 INTRODUCTION

In 1988, as in 1985 and 1986, a limited sampling program was conducted to monitor the level of pesticides in municipal surface water supplies.

A sampling program, specifically for the detection of pesticides in municipal surface water supplies, was not conducted by the MOE in 1987. However, DWSP and OMAF pesticide data has been documented in a MOE report entitled Pesticides in Ontario Municipal Drinking Water from Surface Sources, 1987.

The 1988 program rationale was similar to the 1986 pesticide monitoring program. The triazine group of pesticides, used widely on corn and soybean crops in Ontario, were selected for monitoring.[1] These herbicides were detected during the 1985 and 1986 programs.

Ten water treatment plants, situated in agricultural areas where pesticides are used extensively, were chosen as sampling locations. The locations were limited to those sites where positive results were found in 1985 and 1986.

Southwestern region was the primary sampling target. Six municipal surface water treatment plants were selected. Two locations were selected in West Central region and only one location was selected in each of Central and Southeastern region.

Samples of raw and treated water were collected for analysis. The number of samplings varied. Sampling frequency was decided by the concentrations of pesticides that were detected in 1985 and 1986. The locations that had the highest pesticide analysis results in the earlier programs, were sampled more frequently over a longer sampling period. The highest pesticide concentrations in the raw surface water were expected to occur in June, July and August.[2]

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[1] Survey Of Pesticide Use In Ontario, 1988 - Estimates of Pesticides Used on Field Crops, Fruits and Vegetables (Economics Information Report No. 89-08) Ontario Ministry of Agriculture and Food, 1988.

[2] Pesticides In Ontario Drinking Water - 1986, Ministry of the Environment, November 1987, p. 5.

The 1988 pesticide monitoring program was co-ordinated by Water Resources Branch and implemented by MOE Regional pesticide staff.

This report also includes pesticide results from two other sources: the MOE Drinking Water Surveillance Program (DWSP) for Ontario, and the Ontario Ministry of Agriculture and Food (OMAF).

Table 1 lists the waterworks, the respective surface water sources for each plant, the program designation, and the number of sampling events conducted by the various programs during the year. Figure 1 indicates where in Ontario the waterworks are located.

4.0 ANALYTICAL METHODS

Samples of raw and treated water, collected from municipal surface water treatment works for the MOE 1988 pesticide monitoring program and the DWSP, were analyzed for pesticides by the MOE, Laboratory Services Branch (LSB) in Toronto.

Pesticide analysis, on raw and treated water samples collected from the Dresden waterworks for the OMAF program, was conducted by the OMAF Pesticide Residue Laboratory in Guelph.

Table 2 lists the pesticides that were analyzed for by the MOE and OMAF, the laboratory detection limits, and the recommended guideline value for each compound. A description of the analytical procedures for both laboratories is given in Appendix 1.

TABLE 1: MUNICIPAL WATERWORKS SAMPLED FOR PESTICIDES, 1988

REGION	WATERWORKS	WATER SOURCE	PROGRAM	NUMBER OF SAMPLINGS MOE	DWSP	OMAF
SW	Alvinston	Sydenham River	MOE, DWSP	3	5	-
SW	Amherstburg	Detroit River	MOE, DWSP	9	7	-
SW	Dresden	Sydenham River	MOE, DWSP, OMAF	10	8	29
SW	Mitchell's Bay	Lake St. Clair	MOE, DWSP	14	7	-
SW	Tilbury	Lake St. Clair	MOE	16	-	-
SW	Wallaceburg	Chanel Ecarte	MOE, DWSP	17	9	-
WC	Brantford	Grand River	MOE, DWSP	5	7	-
WC	Cayuga	Grand River	MOE, DWSP	5	6	-
C	Lindsay	Scugog River	MOE	5	-	-
SE	Plantagenet	South Nation River	MOE	1	-	-

MOE - MOE Pesticide Survey
DWSP - Drinking Water Surveillance Program
OMAF - Ontario Ministry of Agriculture and Food

SW - Southwestern
WC - West Central

C - Central
SE - Southeastern

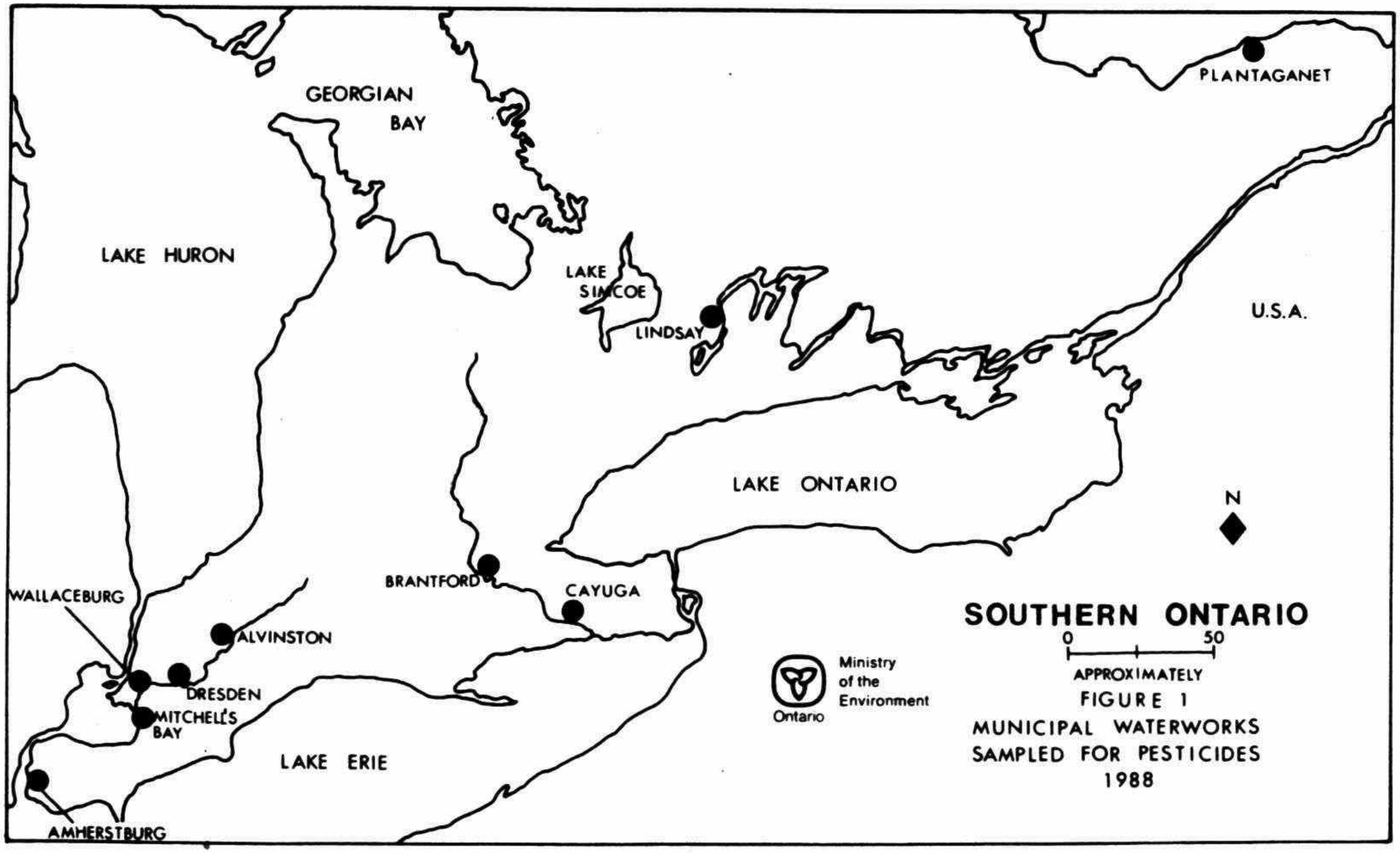
TABLE 2: PARAMETER ANALYSIS LIST, 1988

PARAMETER	DETECTION LIMITS: MOE	OMAF	GUIDELINE	UNITS	REF CODE
Alachlor^{+}	0.50	0.10	5	ug/L	(1)
Ametryne	0.05	-	300	ug/L	(2)
Atratone	0.05	-	-	-	-
Atrazine	0.05	0.10	60 *	ug/L	(3)
D-ethyl atrazine	0.20	0.10	60 *	ug/L	(3)
Cyanazine	0.10	0.10	10	ug/L	(3)
Metolachlor	0.50	0.10	50	ug/L	(3)
Metribuzin (Sencor)	0.10	0.10	80	ug/L	(4)
Prometone	0.05	-	525	ug/L	(2)
Prometryne	0.05	-	1	ug/L	(1)
Propazine	0.05	-	700	ug/L	(2)
Simazine	0.05	-	10 **	ug/L	(3)
D-ethyl simazine	0.20	-	10 **	ug/L	(3)

Note:
* Total of Atrazine plus D-ethyl atrazine
** Total of Simazine plus D-ethyl simazine
+ Banned

Guideline Source:

(1) MOE - Pesticides in Ontario Drinking Water - 1985, August 1987
(2) US EPA - Lifetime Health Advisory
(3) H&WC - Interim MAC
(4) H&WC - MAC



SOUTHERN ONTARIO

FIGURE 1
MUNICIPAL WATERWORKS
SAMPLED FOR PESTICIDES
1988

5.0 RESULTS AND DISCUSSION

A limited number of municipal waterworks, supplied by surface water sources, were monitored for levels of pesticides in both the raw and treated water. The 1988 report includes data from DWSP and the OMAF pesticide monitoring program. The DWSP contributed pesticide results for Alvinston, Amherstburg, Dresden, Mitchell's Bay, Wallaceburg, Brantford and Cayuga. The results of weekly monitoring at Dresden were supplied by the OMAF.

Appendix 2 contains the detailed analysis results, from the three programs, for the following pesticides: alachlor, ametryne, atratone, atrazine, d-ethyl atrazine, cyanazine, metolachlor, metribuzin (Sencor), prometone, prometryne, propazine, simazine and d-ethyl simazine. The MOE results for d-ethyl atrazine and d-ethyl simazine were not reported on a continuous basis at the start of the program. They were added to the MOE pesticide analysis scan in July. The OMAF did not analyze for the parameters ametryne, atratone, prometone and propazine in 1988. Pesticides that were not analyzed were reported as having no result (NR). Samples that were broken before analysis, or not collected, were described as having no sample (NS).

A summary of the results is found in Table 3. The table indicates the number of samples analyzed, the number of occurrences (samples found to contain positive or trace levels of pesticide), and the range of pesticide concentration detected, for each of the locations that were sampled.

In total, 299 samples (153 raw and 146 treated water samples) from ten locations were analyzed for pesticides. Six pesticides: atrazine and its metabolite d-ethyl atrazine, cyanazine, metolachlor, Sencor, and d-ethyl simazine, were detected at positive and/or trace levels.[1] The other pesticides were not detected at any of the sample locations. None of the pesticide values reported, exceeded the applicable guidelines.

The results of the 1988 monitoring program show that, in general, the level of pesticide residues detected were similar to the levels detected in 1987.

---

[1] The results, as reported by the MOE laboratory, that are less than ten times the analysis detection limit are reported as "value" <T. These concentrations are considered to be trace quantities of the determined parameter and do not carry the same confidence as values above T.

In 1987 and 1988, the results of monitoring show that, in general, pesticide levels in both the raw and treated water, were lower than the levels detected in the 1985 and 1986 programs. This may be due to two factors: pesticide usage and climate. The OMAF Survey of Pesticide Use in Ontario, 1988 indicates a 35 percent decrease in the quantity of triazine herbicides used in the province since 1983. Also, the climate conditions of higher than normal temperatures in 1987 and 1988, and low rainfall during the summer months in 1988, could hasten the degradation of pesticides in the soil through the process of evaporation. Evaporation permits the pesticides to migrate to the soil surface where chemical or microbial degradation occurs.

The absence of detectable concentrations of ametryne, atratone, prometone, prometryne, propazine and simazine, at all locations, indicates that these pesticides are being used either in relatively small quantities, or not at all in Ontario. This is consistent with the findings of the OMAF Survey of Pesticide Use in Ontario, 1988. The registration of alachlor was cancelled by the OMAF in 1985, therefore its presence in water supplies would not be expected.

Powdered activated carbon (PAC) was being added prior to chemical treatment at several of the waterworks in 1988. In most cases, PAC was added for taste and odour control, and dosages did not exceed 5.0 mg/L. The Dresden water treatment plant, however, used PAC at dosages of approximately 27 to 37 mg/L from May until September, with average monthly dosages of 13 mg/L in October, and 19 mg/L in November.

It was difficult to determine the reducing effect of PAC on the pesticide levels, because of the lack of significant pesticide concentrations for most locations. The results of monitoring at Dresden, in Appendix 2, show that atrazine concentrations were reduced by 50 percent in less than 25 percent of the samples. This indicates that the treatment process, using PAC at dosages lower than is normally recommended for pesticide control[1], did not effectively reduce the levels of pesticide residues.

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[1] Pesticides In Ontario Drinking Water - 1986, Ministry of the Environment, November 1987, p. 7.

Atrazine (plus D-ethyl atrazine)

Atrazine was detected most frequently and was found at eight of the ten locations sampled. In the raw water, it was detected in 61, or 40 percent, of the 153 samples analyzed, at concentrations ranging from 0.07<T to 13.0 ug/L. Fifty-eight, or 40 percent, of the 146 treated water samples were found to contain atrazine. Concentrations ranged from 0.06<T to 7.97 ug/L. Over one-third of the measurable results were considered to be trace levels. Forty-seven percent of the samples that contained atrazine, also contained traces of d-ethyl atrazine. The maximum concentration of d-ethyl atrazine detected was 1.53 ug/L.

Atrazine occurred most frequently and at the highest values at Dresden. Forty-four raw water samples were submitted for analysis. Thirty-nine occurrences were reported at values ranging from 0.19<T to 13.0 ug/L. Traces of d-ethyl atrazine were detected in 24 of the samples. Ninety percent of the treated water samples analyzed were found to contain atrazine at concentrations ranging from 0.06<T to 7.97 ug/L. Traces of d-ethyl atrazine were found in 22 of these samples. The highest concentrations of atrazine in the raw and treated water occurred during the period from mid July to mid August.

Positive and trace amounts of atrazine were found in two samples of raw and treated water from Alvinston. The maximum concentrations detected were 4.5 ug/L in the raw water and 3.4 ug/L in the treated water.

Fifteen sets of raw and treated water samples from Tilbury were analyzed. Atrazine was present in three of the raw water samples at a maximum level of 0.62 ug/L. Two treated water samples contained traces of atrazine, the maximum concentration being 0.09<T ug/L.

The waterworks at Plantagenet, in Southeastern region, was sampled once during the survey period. The raw water was found to contain 2.08 ug/L atrazine and a trace amount (0.94<T ug/L) of d-ethyl atrazine. In the treated water, 1.44 ug/L atrazine was detected.

Low levels of atrazine were found in the water at Brantford. Forty-five percent of the raw water samples and 64 percent of the treated water samples contained mainly trace quantities of the chemical. Atrazine was detected in five raw water samples, at a maximum concentration of 0.3<T ug/L, and in seven samples of treated water

at concentrations ranging from 0.1<T ug/L to 0.52 ug/L. A trace amount of d-ethyl atrazine (0.25<T ug/L) was found in one treated water sample.

The water at Cayuga yielded similar results. Low levels of atrazine were detected in 73 and 64 percent of the raw and treated water samples respectively. Atrazine was found in eight raw water samples, at concentrations ranging from 0.07<T ug/L to 0.5 ug/L, and from 0.1<T ug/L to 0.32<T ug/L in samples of treated water. Traces of d-ethyl atrazine were present in two raw and two treated water samples at a maximum concentration of 0.38<T ug/L.

Traces of atrazine were found in two samples of raw and treated water from Mitchell's Bay. The maximum level in the treated water was found to be 0.11<T ug/L.

One sample of raw water from Wallaceburg contained atrazine at a trace level of 0.1<T ug/L.

Atrazine was not detected in samples of raw or treated water from Amherstburg or Lindsay.

None of the detected levels in the treated water exceeded 15% of the H&WC IMAC of 60 ug/L for atrazine in drinking water.

Cyanazine

Analysis showed that cyanazine was present in the water at three sample locations. The H&WC IMAC of 10 ug/L, for cyanazine in drinking water, was not exceeded.

The highest levels and most frequent occurrences of cyanazine were detected in the Dresden water samples. Cyanazine was found in a total of 12 samples at a maximum concentration of 1.3 ug/L in the raw water and 1.02 ug/L in the treated water.

At Alvinston, trace levels of cyanazine were detected in one sample of raw water (0.4<T ug/L) and one sample of treated water (0.4<T ug/L).

The one set of samples from Plantagenet contained cyanazine at trace levels of 0.38<T ug/L in the raw water and 0.22<T ug/L in the treated water.

Metolachlor

The H&WC IMAC of 50 ug/L, for metolachlor in drinking water, was not exceeded at any of the four locations at which it was detected.

The water at Dresden was found to have the highest occurrence of metolachlor. Approximately 40 percent of the raw and treated water samples contained the chemical. Concentrations ranged from 0.19<T to 7.7 ug/L in the raw water. Trace levels of 0.17<T to 4.75<T ug/L were detected in the treated water.

One set of samples from Alvinston contained 6.78 ug/L of metolachlor in the raw water and a trace amount of the substance (4.5<T ug/L) in the treated water.

A trace amount of metolachlor (0.59<T ug/L) was found in one sample of raw water from Tilbury.

The raw and treated water at Plantagenet contained metolachlor at trace levels of 0.64<T ug/L and 0.79<T ug/L respectively.

Metribuzin (Sencor)

Sencor was detected in the raw and treated water at one location. Three samples from Dresden were found to contain low levels of Sencor. The maximum concentration of 1.3 ug/L, that was found in the treated water, is well below the H&WC MAC of 80 ug/L.

D-ethyl Simazine

Simazine was not detected in any of the water samples. However, a trace amount of d-ethyl simazine was found in one sample of raw water from Dresden (0.35<T ug/L) and one set of raw and treated water samples from Mitchell's Bay (0.54<T ug/L and 1.93<T ug/L respectively).

TABLE 3: PESTICIDES IN RAW AND/OR TREATED WATER AT MUNICIPAL SURFACE WATERWORKS (1988): SUMMARY OF RESULTS

LOCATION		ALAC*	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
SOUTHWESTERN REGION														
ALVINSTON														
RAW	Samples	7	7	7	7	7	3	7	7	7	7	7	7	7
	Occurrences	0	0	0	2	1	2	0	1	0	0	0	0	0
	Max	-	-	-	4.50	0.40<T	0.95<T	-	6.78	-	-	-	-	-
	Min	-	-	-	1.30	0.40<T	0.64<T	-	6.78	-	-	-	-	-
TREATED	Samples	8	8	8	8	8	3	8	8	8	8	8	8	8
	Occurrences	0	0	0	2	1	2	0	1	0	0	0	0	0
	Max	-	-	-	3.40	0.40<T	0.82<T	-	4.50<T	-	-	-	-	-
	Min	-	-	-	1.37	0.40<T	0.62<T	-	4.50<T	-	-	-	-	-
AMHERSTBURG														
RAW	Samples	15	15	15	15	15	10	15	15	15	15	15	15	15
	Occurrences	0	0	0	0	0	0	0	0	0	0	0	0	0
	Max	-	-	-	-	-	-	-	-	-	-	-	-	-
	Min	-	-	-	-	-	-	-	-	-	-	-	-	-
TREATED	Samples	16	16	16	16	16	11	16	16	16	16	16	16	16
	Occurrences	0	0	0	0	0	0	0	0	0	0	0	0	0
	Max	-	-	-	-	-	-	-	-	-	-	-	-	-
	Min	-	-	-	-	-	-	-	-	-	-	-	-	-
DRESDEN														
RAW	Samples	44	17	17	44	44	40	44	44	17	44	17	44	44
	Occurrences	0	0	0	39	6	24	1	18	0	0	0	2	0
	Max	-	-	-	13.00	1.30	1.50<T	0.35<T	7.70	-	-	-	0.68	-
	Min	-	-	-	0.19<T	0.31<T	0.12<T	0.35<T	0.19<T	-	-	-	0.66	-
TREATED	Samples	41	14	14	41	41	38	41	41	14	41	14	41	41
	Occurrences	0	0	0	37	6	22	0	16	0	0	0	1	0
	Max	-	-	-	7.97	1.02	1.53<T	-	4.75<T	-	-	-	1.3	-
	Min	-	-	-	0.06<T	0.17<T	0.10<T	-	0.17<T	-	-	-	1.3	-

* ALAC (Alachlor) AMET (Ametryne) ATRO (Atratone) ATRA (Atrazine) CYAN (Cyanazine) DATRA (D-ethyl Atrazine) DSIM (D-ethyl Simazine)
MET (Metolachlor) PROM (Pometone) PROY (Prometryne) PROP (Propazine) SENC (Sencor) SIM (Simazine)

Samples: Number of samples analyzed
Units = ug/L

Occurrences: Number of samples found to contain positive or trace levels of pesticides
Value <T: A Measurable trace amount: tentative

TABLE 3: PESTICIDES IN RAW AND/OR TREATED WATER AT MUNICIPAL SURFACE WATERWORKS (1988): SUMMARY OF RESULTS

LOCATION			ALAC*	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
SOUTHWESTERN REGION															
MITCHELL'S BAY															
	RAW	Samples	20	20	20	20	20	16	20	20	20	20	20	20	20
		Occurrences	0	0	0	2	0	0	1	0	0	0	0	0	0
		Max	-	-	-	0.18<T	-	-	0.54<T	-	-	-	-	-	-
		Min	-	-	-	0.15<T	-	-	0.54<T	-	-	-	-	-	-
	TREATED	Samples	21	21	21	21	21	17	21	21	21	21	21	21	21
		Occurrences	0	0	0	2	0	0	1	0	0	0	0	0	0
		Max	-	-	-	0.11<T	-	-	1.93<T	-	-	-	-	-	-
		Min	-	-	-	0.06<T	-	-	1.93<T	-	-	-	-	-	-
TILBURY															
	RAW	Samples	15	15	15	15	15	11	15	15	15	15	15	15	15
		Occurrences	0	0	0	3	0	0	0	1	0	0	0	0	0
		Max	-	-	-	0.62	-	-	-	0.59<T	-	-	-	-	-
		Min	-	-	-	0.10<T	-	-	-	0.59<T	-	-	-	-	-
	TREATED	Samples	15	15	15	15	15	10	15	15	15	15	15	15	15
		Occurrences	0	0	0	2	0	0	0	0	0	0	0	0	0
		Max	-	-	-	0.09<T	-	-	-	-	-	-	-	-	-
		Min	-	-	-	0.06<T	-	-	-	-	-	-	-	-	-
WALLACEBURG															
	RAW	Samples	24	24	24	24	24	16	24	24	24	24	24	24	24
		Occurrences	0	0	0	1	0	0	0	0	0	0	0	0	0
		Max	-	-	-	0.10<T	-	-	-	-	-	-	-	-	-
		Min	-	-	-	0.10<T	-	-	-	-	-	-	-	-	-
	TREATED	Samples	22	22	22	22	22	15	22	22	22	22	22	22	22
		Occurrences	0	0	0	0	0	0	0	0	0	0	0	0	0
		Max	-	-	-	-	-	-	-	-	-	-	-	-	-
		Min	-	-	-	-	-	-	-	-	-	-	-	-	-

* ALAC (Alachlor) AMET (Ametryne) ATRO (Atratone) ATRA (Atrazine) CYAN (Cyanazine) DATRA (D-ethyl Atrazine) DSIM (D-ethyl Simazine) MET (Metolachlor) PROM (Pometone) PROY (Prometryne) PROP (Propazine) SENC (Sencor) SIM (Simazine)

Samples: Number of samples analyzed
Units = ug/L

Occurrences: Number of samples found to contain positive or trace levels of pesticides
Value <T: A Measurable trace amount: tentative

TABLE 3: PESTICIDES IN RAW AND/OR TREATED WATER AT MUNICIPAL SURFACE WATERWORKS (1988): SUMMARY OF RESULTS

LOCATION			ALAC*	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
WEST CENTRAL REGION															
BRANTFORD															
RAW		Samples	11	11	11	11	11	6	11	11	11	11	11	11	11
		Occurrences	0	0	0	5	0	0	0	0	0	0	0	0	0
		Max	-	-	-	0.30<T	-	-	-	-	-	-	-	-	-
		Min	-	-	-	0.10<T	-	-	-	-	-	-	-	-	-
TREATED		Samples	11	11	11	11	11	6	11	11	11	11	11	11	11
		Occurrences	0	0	0	7	0	1	0	0	0	0	0	0	0
		Max	-	-	-	0.52	-	0.25<T	-	-	-	-	-	-	-
		Min	-	-	-	0.10<T	-	0.25<T	-	-	-	-	-	-	-
CAYUGA															
RAW		Samples	11	11	11	11	11	7	11	11	11	11	11	11	11
		Occurrences	0	0	0	8	0	2	0	0	0	0	0	0	0
		Max	-	-	-	0.50	-	0.38<T	-	-	-	-	-	-	-
		Min	-	-	-	0.07<T	-	0.28<T	-	-	-	-	-	-	-
TREATED		Samples	11	11	11	11	11	7	11	11	11	11	11	11	11
		Occurrences	0	0	0	7	0	2	0	0	0	0	0	0	0
		Max	-	-	-	0.32<T	-	0.36<T	-	-	-	-	-	-	-
		Min	-	-	-	0.10<T	-	0.27<T	-	-	-	-	-	-	-
CENTRAL REGION															
LINDSAY															
RAW		Samples	5	5	5	5	5	3	5	5	5	5	5	5	5
		Occurrences	0	0	0	0	0	0	0	0	0	0	0	0	0
		Max	-	-	-	-	-	-	-	-	-	-	-	-	-
		Min	-	-	-	-	-	-	-	-	-	-	-	-	-
TREATED		Samples	0	0	0	0	0	0	0	0	0	0	0	0	0
		Occurrences	-	-	-	-	-	-	-	-	-	-	-	-	-
		Max	-	-	-	-	-	-	-	-	-	-	-	-	-
		Min	-	-	-	-	-	-	-	-	-	-	-	-	-

* ALAC (Alachlor) AMET (Ametryne) ATRO (Atratone) ATRA (Atrazine) CYAN (Cyanazine) DATRA (D-ethyl Atrazine) DSIM (D-ethyl Simazine)
MET (Metolachlor) PROM (Pometone) PROY (Prometryne) PROP (Propazine) SENC (Sencor) SIM (Simazine)

Samples: Number of samples analyzed
Units = ug/L

Occurrences: Number of samples found to contain positive or trace levels of pesticides
Value <T: A Measurable trace amount: tentative

TABLE 3: PESTICIDES IN RAW AND/OR TREATED WATER AT MUNICIPAL SURFACE WATERWORKS (1988): SUMMARY OF RESULTS

LOCATION		ALAC*	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
SOUTHEASTERN REGION														
PLANTAGENET														
RAW	Samples	1	1	1	1	1	1	1	1	1	1	1	1	1
	Occurrences	0	0	0	1	1	1	0	1	0	0	0	0	0
	Max	-	-	-	2.08	0.38<T	0.94<T	-	0.64<T	-	-	-	-	-
	Min	-	-	-	2.08	0.38<T	0.94<T	-	0.64<T	-	-	-	-	-
TREATED	Samples	1	1	1	1	1	1	1	1	1	1	1	1	1
	Occurrences	0	0	0	1	1	0	0	1	0	0	0	0	0
	Max	-	-	-	1.44	0.22<T	-	-	0.79<T	-	-	-	-	-
	Min	-	-	-	1.44	0.22<T	-	-	0.79<T	-	-	-	-	-

* ALAC (Alachlor) AMET (Ametryne) ATRO (Atratone) ATRA (Atrazine) CYAN (Cyanazine) DATRA (D-ethyl Atrazine) DSIM (D-ethyl Simazine) MET (Metolachlor) PROM (Pometone) PROY (Prometryne) PROP (Propazine) SENC (Sencor) SIM (Simazine)

Samples: Number of samples analyzed
Units = ug/L

Occurrences: Number of samples found to contain positive or trace levels of pesticides
Value <T: A Measurable trace amount: tentative

APPENDIX 1

DESCRIPTION OF ANALYTICAL TECHNIQUE FOR PESTICIDE ANALYSIS

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THE DETERMINATION OF TRIAZINE HERBICIDES IN WATER BY GC-TSD

1.0 SUMMARY

Triazine herbicides have been used as selective herbicides for several crops, such as corn and soybeans, to name but a couple. Triazine herbicides are also used in the non-agricultural field for industrial weed and brush control. Triazines are highly selective due to their ability to inhibit photosynthesis in specific plants. Triazines are also highly persistent in soil and may interfere with normal crop rotation. Certain crops, such as tobacco and sugar beet, are highly susceptible to triazines.

1.1 Principle of Method

Samples are solvent-extracted, dried and evaporated to dryness. Column clean-up is done if necessary. The extract is examined by gas chromatography using a thermionic specific detector (TSD).

1.1.1 Relationship to Other Methods.

Not applicable.

1.2 Parameters Measured

The triazine herbicides routinely analyzed in the laboratory with their LIS Test Codes are:

Compound	Test Code
Prometone	P2PROM
Atraton	P2ATRO
Propazine	P2PROP
Atrazine	P2ATRA
Prometryne	P2PROY
Simazine	P2SIM
Ametryne	P2AMET
Sencor	P2SENC
Bladex	P2BLAD
Metalachlor	P0MET
Alachlor	P0LASS

Under optimum condition, 8-10 samples may be analyzed for triazines in 2 days. The range of application is from 0.05 µg/L. The results are reported in µg/L or other units depending on concentrations.

1.3 Sample Matrices

Drinking water and drinking water sources such as surface water and groundwater which are not associated with sewage, industrial waste or landfills.

1.4 Sample Requirements

1.4.1 Specifications.

Samples must be collected in 1 L, brown glass bottles with foil- or Teflon-lined screw caps to prevent contamination. These bottles are solvent rinsed prior to use and are labelled, "For Pesticides and PCB Analysis Only". A minimum sample size of 800 mL is required and 860 mL is preferred. Samples should be refrigerated at 4°C to avoid bacterial degradation. No preservatives should be used.

1.4.2 Contingencies.

1.5 Shortcomings

1.5.1 Interferences.

Glassware used for residue level analysis must be thoroughly cleaned by a series of steps using acetone, detergent and water rinses and baking at 300°C. All glassware must be rinsed thoroughly with solvent prior to use.

Even though few interferences are encountered during gas chromatographic analysis, due to the specificity of the thermionic specific detector (TSD), the presence of other nitrogen containing or phosphorous containing compounds may interfere with the analysis and/or confirmations to some extent. Water samples do not require clean-up prior to gas chromatographic analysis.

1.5.2 Biases.

Organic component losses occur during sample processing and are the result of factors which are inherent in any organic extraction technique. Problems such as the formation of emulsions, oxidation and volatization of compounds during extraction as well as evaporation loss during solvent concentration all contribute to some reduction in organic component recovery.

1.5.3 Limitations.

1.6 Analytical Performance Summary

1.6.1 Single Analyst (Within-run) Precision.

Not available.

1.6.2 Between-Run Precision (Standards).

Not applicable.

1.6.3 Between-Run Precision (Typical Samples).

Not applicable.

1.6.4 Inter-Method Comparison.

Not available.

1.6.5 Inter-Lab Comparison (Same Method).

Not available.

1.6.6 Inter-Lab Comparison (Different Method).

Not available.

1.6.7 Method Recovery (Reference Materials).

Not applicable.

1.7 Bibliography

1.7.1 U.S. Environmental Protection Agency; 1976. Analysis of Pesticide Residues in Human and Environmental Samples. Environmental Toxicology Division, Health Effects Laboratory, Research Triangle Park, N.C.

1.7.2 U.S. Department of Health, Education and Welfare; 1965. Guide to the Analysis of Pesticide Residues - Volumes 1 and 2. Public Health Service, Bureau of State Services (Environmental Health), Office of Pesticides, Washington, D.C.

1.8 History of Changes/Revisions

Not available.

2.0 SAMPLE PREPARATION

2.1 Labwares

NOTE: Equipment equivalent to that used in this method is acceptable.

2.1.1 Dispenser, pipettor, adjustable plunger-type, EM Optifix, 50 Ml.

2.1.2 Cylinder, graduated, 1 L.

2.1.3 Pipette, graduated, 25 mL.

2.1.4 Pipette, transfer, volumetric, 1 mL.

2.1.5 Beaker, Pyrex, 100 mL.

2.1.6 Flask, Erlenmeyer, 250 mL.

2.1.7 Ring, cork, 60 mm ID.

2.1.8 Funnel, Pyrex filter, 60 slope with 65 mm top ID and 65 mm stem length.

2.1.9 Flask, round bottom, 250 mL with 24/40 t/s joint.

2.1.10 Pipette, Pasteur, diposable.

2.1.11 Tube, graduated centrifuge, 50 mL.

2.1.12 Vial, screw cap, with Teflon septa.

2.1.13 Pipette, volumetric, 2 mL.

2.1.14 Separators, Phase, Silicone treated, 15 cm, Whatman 1PS.

2.2 Reagents

NOTE: Solvents pose fire and exposure hazards, therefore, extreme care must be taken during their transport, storage and use.

2.2.1 Potassium hydroxide, KOH, concentrated.

2.2.2 Dichloromethane, CH_3Cl_2, distilled-in-glass, Caledon.

2.2.3 Acetone, CH_3COCH_3, reagent grade, Caledon.

2.2.4 Iso-octane, $(CH_3)_3CCH_2CH(CH_3)_2$, (2,2,4-trimethylpentane), distilled-in-glass, Caledon.

2.2.5 Diethyl ether, $(C_2H_5)_2O$, distilled-in-glass, Caledon.

2.2.6 Iso-propanol, $CH_3CHOHCH_3$, distilled-in-glass, Caledon.

2.2.7 Water, distilled, DW.

2.2.8 Chromic acid, H_2CrO_7, reagent grade.

2.2.9 Nitric acid, HNO_3, reagent grade.

2.3 Equipment

2.3.1 Roller, 90-100 rpm.

2.3.2. Evaporator, rotary flask, Buchler.

2.1.4 Vacuum line system, in-house.

2.4 Glassware Preparation

2.4.1 Rinse all glassware, except pipettes, with tap water and run through the dishwasher.

2.4.2 Soak pipettes for 0.5 hours in reagent grade CH_3COCH_3, rinse with tap water and place in surfactant detergent tank.

NOTE: Pipettes are rinsed with H_2CrO_7 weekly.

2.4.3 After soaking in detergent for 0.5 hours, rinse pipettes with tap water followed by DW.

2.4.4 Place all glassware in drying oven set at 300°C for 12 hours.

2.5 Extraction Procedure

All samples undergo an addition of base (KOH) followed by solvent extraction and solvent concentration prior to Gas Chromatographic analysis. The column clean-up step has been eliminated due to the relatively clean nature of the water samples which are being tested.

2.5.1 Samples are received in pre-rinsed, cleaned and labelled 1 L brown glass bottles with Teflon- or foil-lined screw caps.

NOTE: The cleaning procedure involves a detergent washing, a rinsing (with 5% HNO_3), a tap water wash and a DDW water rinsing. The temperature of the water is 80°C.

2.5.2 Shake each sample vigorously, if needed, and discard a portion bringing sample to appropriate volume for extraction (approximately 800 mL). Remove foil liner as it can cause the cap to leak.

2.5.3 Make up one blank and one spike to be processed along with each set of samples. (Blanks consist of 800 mL tap water while spikes consist of 800 mL of tap water containing 1 mL of Spike Solution (see Section 5.2) in CH_3COCH_3 Warm the Spike Solution to room temperature before adding to the bottle.)

2.5.4. Add Potassium Hydroxide Solution to make the samples, spike and blank, basic (pH 12) and check the actual pH with pH or litmus paper (normally only one Pasteur pipette of Potassium Hydroxide Solution is needed). The litmus paper should turn dark blue.

2.5.5 Using the plunger type pipettor dispenser add 80 mL of CH_2Cl_2 to each sample, spike and blank.

2.5.6 Place the bottles on the roller and roll for 30 minutes at 90-100 rpm.

2.5.7 Rinse the 250 mL round bottom flasks and Erlenmeyer flasks with ~25 mL of CH_2Cl_2; swirl the CH_2Cl_2 in the flask and collect the wash in a pre-rinsed round bottom flask. Repeat with second 25 mL aliquot of CH_2Cl_2.

2.5.8 Rinse the 25 mL graduated measuring pipettes with 80 mL of CH_2Cl_2 by drawing CH_2Cl_2 up each pipette and add this wash to the flask wash.

2.5.9 Remove the bottles from the roller and siphon off the lower CH_2Cl_2 layer using a pre-rinsed 25 mL pipette and the in-house vacuum line system. Place the CH_2Cl_2 layer in a labelled, rinsed, Erlenmeyer flask.

NOTE: Care should be taken to ensure that minimal or no water is transferred.

2.5.10 Use one pipette for each sample and leave pipette standing in the appropriate Erlenmeyer flask after the extract is drawn off.

2.5.11 Using a second 80 mL of CH_2Cl_2 followed by 40 mL of CH_2Cl_2. Repeat Steps 2.5.6, 2.5.9, and 2.5.10, adding siphoned extracts to the appropriate Erlenmeyer flask. Samples may be left overnight with the flasks covered by aluminum foil, shiny side down.

2.5.12 If large amounts of water are present in the flask, excess water can be removed using a disposable Pasteur pipette and put back in the 1 L bottle.

2.5.13 Measure the sample volumes by emptying each sample into a 1 L graduated cylinder and noting the volume. Samples are discarded.

2.5.14 Set up the necessary number of filter funnels, with folded phase separator papers (folded radially 4 times to form a cone), in the 250 mL pre-rinsed round bottom flasks resting on cork rings.

2.5.15 Pour approximately 20 mL of CH_2Cl_2 through each filter. The solvent may be used again through a second filter.

2.5.16 Filter the samples, spike and blank from the Erlenmeyer flasks through the phase separator filter into the 250 mL round bottom flasks.

2.5.17 Rinse each Erlenmeyer flask with 10 mL of CH_2Cl_2 and pass the rinse through the appropriate filter funnel.

2.5.18 Add 2 mL of $(CH_3)_3CCH_2CH(CH_3)_2$ to the extracts in the round bottom flasks.

2.5.19 Rinse the rotary flash evaporator with a small amount of CH_2Cl_2 before evaporating any samples. Set up the 250 mL round bottom flasks containing sample, spike, blank or glassware rinse on the rotary flash evaporator and concentrate to approximately 1 mL. (The remaining liquid is approximately the size of a quarter.)

2.5.20 Add 5 mL of $(CH_3)_3CCH_2CH(CH_3)_2$ to each flask. Evaporate to dryness on the rotary evaporator.

2.5.21 Add 2 mL of $CH_3CHOHCH_3$ using an Eppendorf pipette to each round bottom flask. Use an separate pipette tip for each sample. Use the individual pipette to rinse down the sides of the round bottom flask with the 2 mL of $CH_3CHOHCH_3$. Let the sample sit for about 5 minutes before transferring the extract to the screw cap vials for Gas Chromatographic analysis.

3.0 ANALYTICAL PROCESSING

Water samples do not normally need to be processed through the Clean-up procedure as they are 'clean' samples, and are ready for submission to the Detection System after extraction.

4.0 DETECTION SYSTEM

4.1 Labwares

None required.

4.2 Reagents

4.2.1 Gas, carrier, ultra pure nitrogen, 4 mL/minute.

4.2.2 Gas, make-up, ultra pure nitrogen, 30 mL/minute.

4.2.3 Gases, flame, extra dry air, 175 mL/minute; pre-purified hydrogen, 4.5 mL/minute.

4.3 Equipment

4.3.1 Traps, gas: hydrocarbon; oxygen; and moisture.

4.3.2 Chromatograph, Gas, Varian, Model 3700.

4.3.3 Columns, Dual Capillary, fused silica:

30 m DBWAX: .25 mm bore
.25 µm coating
30 m DB1701: .25 mm bore
.25 µm coating.

4.3.4 Detectors, TDS, dual.

4.4 Gas Chromatographic Analysis Procedure

4.4.1 Check all the gas cylinders to ensure that the pressure will not drop below 500 psi for the number of samples expected to be run.

4.4.2 Check the chart paper and storage disk space to ensure that a sufficient supply is available to complete the run.

4.4.3 Check the program for the Gas Chromatograph.

4.4.4 Set the baseline on the Gas Chromatograph to zero, if applicable.

4.4.5 Check the syringe alignment and volume.

4.4.6 All instrument problems should be noted in the instrument logbook including method changes, modifications to the instrument, changes of columns, septa, traps, etc.

4.4.7 The injection septa of each Gas Chromatograph must be changed every week, or when problems arise thought to be due to poor septum performance. If a Gas Chromatograph is to be left idle for more than half a day, the temperature of the oven should be left at 200°C after the final sample has been run.

4.4.8 The following traps must be inserted in the corresponding gas lines and changed every three months:

Gas	Traps
nitrogen (for autosampler)	charcoal
nitrogen (for makeup)	charcoal/molecular sieve/ oxygen
helium	oxygen/charcoal/molecular sieve
air	charcoal/molecular sieve
hydrogen	charcoal/molecular sieve/ oxygen.

4.4.9 Settings for the Gas chromatograph.

Attenuation: 1×10^{-12}
Injector Temperature: 200°C.
Detector Temperature: 300°C.
Temperature Program: Initial 100°C for 0 minutes
: Rate 4°C/minute
: Final 240°C for 2 minutes.

5.0 CALIBRATION AND STANDARDIZATION

5.1 Labwares

5.1.1 Flask, volumetric, 100 mL.

5.2 Standards and Reference Materials

Standards are stored in the freezer. Standard solutions are stored in a cool, dark place. Standards are disposed of by pouring them into an empty 4 L solvent bottle. This bottle is appropriately labelled by the supervisor and sent to Tricil.

5.2.1 Acetone, CH_3COCH_3, distilled-in-glass, Caledon.

5.2.2 Iso-octane, $(CH_3)_3CCH_2CH(CH_3)_2$, distilled-in-glass, Caledon.

5.2.3 Test Component Stock Solutions (100 µg/mL made from material not less than 95% pure).

Dissolve 0.010 g of the individual herbicides (listed in Table 1) in 10 mL of CH_3COCH_3 and make up to 100 mL in individual volumetric flasks with CH_3COCH_3.

5.2.4 Test Component Standard Mix (ng/mL).

In a volumetric flask, dilute an appropriate aliquot of each Stock Solution (100 µg/mL prepared in Section 5.2.4) serially with $(CH_3)_3CCH_2CH(CH_3)_2$ to give the final mixture concentrations listed in Table 1 as "Injection Standard".

5.2.5 Spike Solution.

Dilute the required aliquot of each Stock Solution (100 µg/mL) in a 100 mL volumetric flask with CH_3COCH_3, to give the final concentration listed in Table 1 as "Spiking Standard".

NOTE: The same Stock Solutions (see Section 5.2.3) are used for the Spike Solution as are used for the Test Component Standard (Injection Standard).

TABLE 1 **SPIKING SOLUTIONS**

Compound	Minimum Measurable Value ppt	Injection Standard ng/mL	Spiking Standard ng/mL
Prometone	50	500	200
Atraton	50	500	200
Propazine	50	500	200
Atrazine	50	500	200
Prometryne	50	500	200
Simazine	50	500	200
Ametryne	50	500	200
Sencor	100	1000	400
Bladex	100	500	200
Metalachlor	500	2500	1000
Alachlor	500	2500	1000

5.3 Equipment

5.3.1 Balance, analytical, accurate to ±1 mg.

5.4 Calibration Procedure

5.4.1 Make a solvent ($(CH_3)_3CCH_2CH(CH_3)_2$) injection to insure that no interferences are present on the column.

5.4.2 Inject the Test Component Standard (storing raw data). All peaks should be sharp with little or no tailing.

5.4.3 If the retention times have changed for any of the Standards, the new time must be inserted in the computer. Set percent, update at 10%. All peaks should be updated to the proper concentration. (e.g., If Prometon was found to be 490 ng/mL, the computer will update the concentration to 500 ng/mL, based on the new retention time.) If some of the peaks are not updated, the chromatogram should be checked to ensure that the peak is properly identified and the retention times have not changed. Individual Standards must be run if there is any doubt. A second Standard should be run to make sure the system is stable if the retention times are manually updated. Samples now ready to be run.

6.0 RUN PROCESSING AND QUALITY ASSURANCE

6.1 Run Format

6.1.1 Run the Test Component Standard Mix on the Varian Model 3700 Gas Chromatograph against Methods TRI 1 and TRI 2. ('Methods' are procedures programmed into the Vista 402 microcomputer). Check retention times and response factors for each component.

6.1.2 Using the Test Component Standard Mix (which was saved on the disc), recalibrate the instrument adjusting data response factors and retention times.

6.1.3 Place screw cap vials containing samples, spikes, blanks and glassware rinses on the autosampler the gas chromatograph. Enter the appropriate dilutions and sample numbers in the Vista 402 System workstation.

6.1.4 Run the samples, spikes and blanks and interpret resulting chromatograms to establish the presence/absence of components and, in turn, quantify any components present.

6.1.5 The run format is as follows:

Solvent (iso-octane)
Calibration Standard #1
Blank
Spike
Glassware rinse
Samples 1 - 10
Standard #1
Standard #2
Solvent
Samples 11 - 20
Standard #1
Standard #2
Solvent
Samples 21 - 30
etc.

NOTE: The run format should be recorded in the instrument logbook, including dilution factors used and current date, and the instrument the samples are run on, the method used, and rack and vial.

NOTE: Standard #2 is to be made up independently of Standard #1 and both are to be checked against the equivalent standard of Trace Organics Section.

NOTE: Standards and a solvent blank are run at the end of the daily run.

6.2 Run Control Operations/Limits

6.2.1 Blanks and spikes should be run with the samples with which they were extracted, whenever possible.

6.2.2 Blank values must be subtracted from the sample values extracted simultaneously.

6.2.3 Glassware rinses are not subtracted but are used as a guide to indicate glassware cleaning problems.

6.2.4 The baseline and noise of the instrument must be plotted each day.

6.2.5 When the Standard or Spiking Solution is changed, the new Standard must be compared, in triplicate, with the old and the relevent chromatograms stored in a Standard file. The date of this change must be documented. The new peak area must be less than 20% different from the current peak area.

6.2.6 A new Working Standard for organophosphorous pesticides, and polynuclear aromatic hydrocarbons is prepared from an Intermediate Combined Solution at approximately 6-month intervals, or when the volume of the Standard drops by more than one-third in the 100 mL volumetirc flask, whichever is sooner.

6.2.7 For all other analytical tests, a new Working Standard is prepared from an Intermediate Combined Solution when the volume of the previous Standard drops by more than one-third in the 100 mL volumetric flask.

6.2.8 For all analytical tests, the new Injection/Spiking Standard is analyzed in triplicate relative to a calibration generated using the previous Standard.

6.2.9 The average response is compared as a ratio of area counts for each compound in the Standard, with an acceptance limit of 20% difference.

6.2.10 The results of the comparison are recorded on the Validation of Organic Standard Solution form stored in the Organic Water Unit Standards binder.

6.2.11 The relevant chromatograms are stored in the corresponding Standards file, the date of change is recorded, and the Standard is signed off for use by the senior technical staff, scientist or supervisor.

6.2.12 In cases where the 20% acceptance criteria are not met, a new Working Standard is obtained by performing the appropriate dilution from a new Intermediate Combined Solution.

6.2.13 When the second Working Standard fails to meet the acceptance criteria, new individual Concentrated Stock Solutions are prepared for the parameter(s) which fall outside the 20% difference limit. The average area counts for these parameters are recorded and deviations from previous Standards are noted.

6.3 Calculation Procedure

6.3.1 Results are obtained from peak areas based on the following formula:

$$\text{result in sample} = \frac{\text{area X factor}}{\text{divisor X 10000}} \text{ X multiplier}$$

NOTE: Amount Standard, divisor and multiplier are all preset by the operator of the Data System. The divisor or multiplier is used to convert the concentration back to the concentration in the original sample.

6.3.2 Calibration factors (cf) convert the measured area for a compound into the amount present. Calibration factors are calculated during a calibration run using the formula:

$$\text{cf component} = \frac{\text{amount Standard}}{\text{area Standard}}$$

The stored calibration factors are then used in subsequent analysis runs to calculate the final results using the formula:

$$\text{amounts in sample} = \text{area in sample X cf of component}$$

The calibration factors are absolute factors based on precise repetitive injection of the same sample size. The Varian Vista 402 Data System calculates the final results using slightlty modified versions of the above formulas.

$$\text{factor component} = \frac{\text{(amount in the Standard)(amount of the Standard)}}{\text{area in the Standard}} \text{X 10000}$$

6.3.3 In order for a peak to be accepted as a valid component of a sample, the following must be provided:

i) the peak must be identified on both columns.
ii) the time offset is less than 0.1 minute on both columns.
iii) the difference in the offset of the two columns is absolutely less than 0.03 minutes.

iv) there is an identifiable peak on the chromatograms at the retention times quoted and the area noted roughly in proportion to the area of a peak in an uncluttered portion of the chromatogram.

6.4 Reporting

6.4.1 The concentrations calculated for each column are averaged if the larger concentration is less than 1.5 times the smaller. If the larger concentration is greater than this value, it is assumed that there is an interference and the lower concentration is reported.

6.4.2 It is the responsibility of the person doing the submission approval to ensure, as far as possible, that the results reported are those actually in the sample sent in to the laboratory.

6.4.3 Detection criteria in µg/L are as follows:

Prometone	0.05	Simazine	0.05
Atraton	0.05	Ametryne	0.05
Propazine	0.05	Sencor	0.10
Atrazine	0.05	Bladex	0.10
Prometryne	0.05	Metalachlor	0.50
Alachlor	0.50		

6.4.5 Des Ethyl Atrazine (LIS Test Code P2DATR) and Des Ethyl Simazine (LIS Test Code P2DSIM) are also detected by this scan.

6.5 Proficiency Testing

6.5.1 New technicians practice doing extractions on blanks and spikes before extracting any samples.

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de l'Alimentation

Pesticide Residue Laboratory
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Tél: (519) 823-8800, poste 4825

12 December 1989

The method used for our herbicide screen is that as described on the attached page. Gas chromatographic analysis was performed primarily on capillary machines with packed column machines used as alternates. Conditions are indicated on a separate page which is also enclosed.

The following indicates various recoveries for acetanilide and triazine herbicides routinely analyzed in our herbicide scan. The acetanilides which include alachlor and metolachlor have recoveries from 92 to 109% with standard deviations of 6.4 to 8.2 at fortification levels of 0.25 to 20 ug L^{-1} (ppb). Triazines which include atrazine, d-atrazine, simazine, d-simazine, prometryn and metribuzin show recoveries ranging from 72 to 112% with a maximum standard deviation of 12% over the fortification range of 0.125 to 10 ug L^{-1} (ppb). Cyanazine is slightly more variable and ranges from 102 to 124% over the range of 0.25 to 20 ug L^{-1} (ppb) with a standard deviation which ranges from 12 to 16%. Our detection limit for these herbicides in water is 0.1 ppb.

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EXTRACTION OF TRIAZINE RESIDUES IN WATER

1. Transfer a measured volume (approx 1000 mL) of sample water into a 2000 mL sep. funnel.
2. Adjust pH to 9 by adding a few drops of ammonium hydroxide (dil 1:2.5).
3. Add 100 mL of chloroform ($CHCl_3$).
4. Let layers separate, then drain the chloroform phase through a piece of $CHCl_3$ pre-washed and dried cotton into a 500 mL boiling flask.
5. Repeat extraction with 100 mL of $CHCl_3$.
6. Evaporate the combined $CHCl_3$ extracts on a rotary evaporator (50-60°C water bath) almost to dryness.
7. Add to the residue 10 mL of iso-octane and continue evaporation to dryness.
8. Dissolve the triazine residue in 5 mL of methanol.
9. Use for GLC system to quantitate the residues.

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Un bon goût de chez nous
FOODLAND ONTARIO

Experimental Conditions and Equipment

Gas Chromatograph:	Perkin-Elmer 8320B Capillary	
Detector:	Nitrogen/Phosphorus	
Column:	J & W SE54 0.25 mm x 15 m 0.25 um film thickness Chromatographic Specialties	
Carrier Gas:	He 20 psi head pressure 30 cm sec^{-1} linear velocity	
Oven Profile:	Temperature 1	60°C
	Hold	1 minute
	Ramp Rate 1	20° min^{-1}
	Temperature 2	150°
	Hold	0 minute
	Ramp Rate 2	5°C min^{-1}
	Temperature 3	220°C
	Hold	2 minutes
Injector Temperature:		225°C
Dector Temperature:		300°C
Injection:	2 ul, split 10:1	
Alternate:	Tracor 550 Gas Chromatograph Hall Detector - Nitrogen Mode Packed Column: 2.0 mm ID x 1.2 m Carbowax 20 M @ 190°C isothermal.	

APPENDIX 2

1988 PESTICIDE ANALYSIS RESULTS

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: SOUTHWESTERN LOCATION: ALVINSTON

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 30	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 30	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 30 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 30 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 13	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 06 13	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18 *	R	BDL	BDL	BDL	4.50	0.40 <T	0.95 <T	BDL	6.78	BDL	BDL	BDL	BDL	BDL
88 07 21 *	T	BDL	BDL	BDL	3.40	0.40 <T	0.62 <T	BDL	4.50 <T	BDL	BDL	BDL	BDL	BDL
88 09 19 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 19 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 18 *	R	BDL	BDL	BDL	1.30	BDL	0.64 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 18 *	T	BDL	BDL	BDL	1.37	BDL	0.82 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: SOUTHWESTERN LOCATION: AMHERSTBURG

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 16 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 18 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 30	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 01	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 13	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 15	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 20 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 22 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 27	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 27	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 07 11	R	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 07 13	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 20 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 25	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 27	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 08	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 10	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 15 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 17 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 22	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 24	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 06	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 08	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 19 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 21 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 20	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 22	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 17 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 19 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 21 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 23 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
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DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: SOUTHWESTERN LOCATION: DRESDEN

YR	MO	DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88	05	09	* R	BDL	BDL	BDL	0.19 <T	BDL	0.12 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	05	09	* T	BDL	BDL	BDL	0.06 <T	BDL	0.25 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	05	11	** R	BDL	BDL	BDL	0.19	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	05	11	** T	BDL	BDL	BDL	0.16	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	05	19	** R	BDL	BDL	BDL	2.50	0.46	0.76	BDL	3.90	BDL	BDL	BDL	0.66	BDL
88	05	19	** T	BDL	BDL	BDL	3.50	0.63	0.80	BDL	4.70	BDL	BDL	BDL	1.30	BDL
88	05	26	** R	BDL	BDL	BDL	2.40	0.40	0.53	BDL	3.10	BDL	BDL	BDL	BDL	BDL
88	05	26	** T	BDL	BDL	BDL	2.30	0.66	0.53	BDL	2.70	BDL	BDL	BDL	BDL	BDL
88	05	31	R	BDL	BDL	BDL	1.80	BDL	0.40 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	05	31	T	BDL	BDL	BDL	2.00	BDL	0.60 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	01	** R	BDL	BDL	BDL	1.70	BDL	0.33	NR	1.60	BDL	BDL	BDL	BDL	BDL
88	06	01	** T	BDL	BDL	BDL	2.00	BDL	0.40	NR	2.00	BDL	BDL	BDL	BDL	BDL
88	06	08	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	08	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	09	** R	BDL	BDL	BDL	1.20	BDL	0.30	BDL	1.40	BDL	BDL	BDL	BDL	BDL
88	06	09	** T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88	06	13	* R	BDL	BDL	BDL	0.43 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	13	* T	BDL	BDL	BDL	0.15 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	14	R	BDL	BDL	BDL	0.52	BDL	0.17 <T	0.35 <T	BDL	BDL	BDL	BDL	BDL	BDL
88	06	14	T	BDL	BDL	BDL	0.34 <T	BDL	0.18 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	15	** R	BDL	BDL	BDL	0.73	BDL	0.36	BDL	1.50	BDL	BDL	BDL	BDL	BDL
88	06	15	** T	BDL	BDL	BDL	0.66	BDL	0.40	BDL	1.70	BDL	BDL	BDL	BDL	BDL
88	06	21	R	BDL	BDL	BDL	0.49 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	21	T	BDL	BDL	BDL	0.33 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	22	** R	BDL	BDL	BDL	0.43	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	06	22	** T	BDL	BDL	BDL	0.33	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	06	28	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88	06	28	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88	06	30	** R	BDL	BDL	BDL	0.68	BDL	0.38	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	06	30	** T	BDL	BDL	BDL	0.30	BDL	0.14	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
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ATRA - Atrazine
CYAN - Cyanazine
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MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

YR	MO	DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88	07	05	R	BDL	BDL	BDL	0.30 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	05	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88	07	06	** R	BDL	BDL	BDL	0.80	BDL	0.40	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	06	** T	BDL	BDL	BDL	0.60	BDL	0.26	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	11	* R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	11	* T	BDL	BDL	BDL	0.07 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	13	** R	BDL	BDL	BDL	0.40	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	13	** T	BDL	BDL	BDL	0.26	BDL	0.30	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	19	R	BDL	BDL	BDL	0.61	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	19	T	BDL	BDL	BDL	0.13 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	21	** R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88	07	21	** T	BDL	BDL	BDL	0.14	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88	07	26	R	BDL	BDL	BDL	7.40	0.78 <T	1.07 <T	BDL	4.08	BDL	BDL	BDL	BDL	BDL
88	07	26	T	BDL	BDL	BDL	7.75	0.68 <T	1.01 <T	BDL	4.60	BDL	BDL	BDL	BDL	BDL
88	07	26	R	NR	NR	NR	NR	NR	NR	NR		NR	NR	NR	NR	NR
88	07	26	T	BDL	BDL	BDL	7.97	1.02	1.53 <T	BDL	4.75	BDL	BDL	BDL	BDL	BDL
88	07	28	** R	BDL	BDL	BDL	13.00	1.30	1.40	BDL	7.70	BDL	BDL	BDL	0.68	BDL
88	07	28	** T	BDL	BDL	BDL	7.90	BDL	0.80	BDL	3.80	BDL	BDL	BDL	BDL	BDL
88	08	03	R	BDL	BDL	BDL	4.10	0.90 <T	BDL	BDL	1.50 <T	BDL	BDL	BDL	BDL	BDL
88	08	03	T	BDL	BDL	BDL	2.40	0.85 <T	BDL	BDL	0.95 <T	BDL	BDL	BDL	BDL	BDL
88	08	04	** R	BDL	BDL	BDL	9.00	BDL	1.10	BDL	4.30	BDL	BDL	BDL	BDL	BDL
88	08	04	** T	BDL	BDL	BDL	4.70	BDL	0.50	BDL	2.30	BDL	BDL	BDL	BDL	BDL
88	08	08	* R	BDL	BDL	BDL	2.42	0.31 <T	0.87 <T	BDL	2.21 <T	BDL	BDL	BDL	BDL	BDL
88	08	08	* T	BDL	BDL	BDL	1.15	0.17 <T	0.25 <T	BDL	1.08 <T	BDL	BDL	BDL	BDL	BDL
88	08	10	** R	BDL	BDL	BDL	3.50	BDL	1.50	BDL	2.90	BDL	BDL	BDL	BDL	BDL
88	08	10	** T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88	08	17	** R	BDL	BDL	BDL	1.20	BDL	0.30	BDL	1.10	BDL	BDL	BDL	BDL	BDL
88	08	17	** T	BDL	BDL	BDL	0.40	BDL	0.16	BDL	0.80	BDL	BDL	BDL	BDL	BDL
88	08	24	** R	BDL	BDL	BDL	1.90	BDL	0.80	BDL	0.71	BDL	BDL	BDL	BDL	BDL
88	08	24	** T	BDL	BDL	BDL	0.56	BDL	0.10	BDL	0.35	BDL	BDL	BDL	BDL	BDL
88	08	31	** R	BDL	BDL	BDL	0.60	BDL	0.25	BDL	0.26	BDL	BDL	BDL	BDL	BDL
88	08	31	** T	BDL	BDL	BDL	0.31	BDL	0.12	BDL	0.17	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
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MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: SOUTHWESTERN LOCATION: DRESDEN (Cont'd)

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 09 07	** R	BDL	BDL	BDL	1.30	BDL	0.31	BDL	0.19	BDL	BDL	BDL	BDL	BDL
88 09 07	** T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 12	* R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 12	* T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 09 14	** R	BDL	BDL	BDL	0.43	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 14	** T	BDL	BDL	BDL	0.23	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 21	** R	BDL	BDL	BDL	0.23	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 21	** T	BDL	BDL	BDL	0.13	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 05	** R	BDL	BDL	BDL	0.56	BDL	0.40	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 05	** T	BDL	BDL	BDL	0.33	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 11	* R	BDL	BDL	BDL	0.32 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 11	* T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 10 12	** R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 12	** T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 19	** R	BDL	BDL	BDL	0.70	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 19	** T	BDL	BDL	BDL	0.56	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 27	** R	BDL	BDL	BDL	2.00	BDL	0.43	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 27	** T	BDL	BDL	BDL	1.10	BDL	0.27	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 02	** R	BDL	BDL	BDL	1.60	BDL	0.83	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 02	** T	BDL	BDL	BDL	1.30	BDL	0.76	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 09	** R	BDL	BDL	BDL	1.50	BDL	0.42	BDL	0.62	BDL	BDL	BDL	BDL	BDL
88 11 09	** T	BDL	BDL	BDL	0.42	BDL	0.10	BDL	0.31	BDL	BDL	BDL	BDL	BDL
88 11 14	* R	BDL	BDL	BDL	1.60	BDL	BDL	BDL	0.61 <T	BDL	BDL	BDL	BDL	BDL
88 11 14	* T	BDL	BDL	BDL	1.75	BDL	BDL	BDL	0.55 <T	BDL	BDL	BDL	BDL	BDL
88 11 17	** R	BDL	BDL	BDL	2.10	BDL	0.27	BDL	0.47	BDL	BDL	BDL	BDL	BDL
88 11 17	** T	BDL	BDL	BDL	1.40	BDL	0.24	BDL	0.37	BDL	BDL	BDL	BDL	BDL
88 11 23	** R	BDL	BDL	BDL	1.00	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 23	** T	BDL	BDL	BDL	0.85	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 28	* R	BDL	BDL	BDL	0.77	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 28	* T	BDL	BDL	BDL	1.61	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 30	** R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 11 30	** T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988)   REGION: SOUTHWESTERN   LOCATION: MITCHELL'S BAY

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 16 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 18 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 23	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 25	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 06	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 08	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 20	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 06 22	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 06 20 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 22 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 07 04	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 06	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 20	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 20 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 02	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 04	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 15	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 16	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 15 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 16 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 29	R	BDL	BDL	BDL	0.15 <T	BDL	BDL	0.54 <T	BDL	BDL	BDL	BDL	BDL	BDL
88 08 29	T	BDL	BDL	BDL	0.11 <T	BDL	BDL	1.93 <T	BDL	BDL	BDL	BDL	BDL	BDL
88 09 12	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 09 14	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 19 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 21 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 26	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 28	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L   Type R - Raw   T - Treated   BDL - Below Detection Limit   NR - No Result   NS - No Sample   <T - A measurable trace amount: tentative

* - DWSP   ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988)   REGION: SOUTHWESTERN   LOCATION: MITCHELL'S BAY (Cont'd)

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 10 11	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 13	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 17 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 19 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 24	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 26	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 07	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 09	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 21	R	BDL	BDL	BDL	0.18 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 23	T	BDL	BDL	BDL	0.06 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 21 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 23 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L   Type R - Raw   T - Treated   BDL - Below Detection Limit   NR - No Result   NS - No Sample   <T - A measurable trace amount: tentative
* - DWSP   ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988)   REGION: SOUTHWESTERN   LOCATION: TILBURY

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 24	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 24	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 31	R	BDL	BDL	BDL	0.62	BDL	NR	NR	0.59 <T	BDL	BDL	BDL	BDL	BDL
88 05 31	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 06	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 06	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 15	R	BDL	BDL	BDL	0.10 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 15	T	BDL	BDL	BDL	0.09 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 06 21	T	BDL	BDL	BDL	0.06 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 07 06	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 06	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 27	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 27	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 03	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 03	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 07	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 07	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 13	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 13	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 19	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 19	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 28	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 28	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 19	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 19	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 25	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 25	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 21	R	BDL	BDL	BDL	0.59	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 21	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

NOTE: Units = ug/L   Type R - Raw   T - Treated   BDL - Below Detection Limit   NR - No Result   NS - No Sample   <T - A measurable trace amount: tentative
* - DWSP   ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: SOUTHWESTERN LOCATION: WALLACEBURG

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 09 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 10 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 24	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 25	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 06	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 07	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 13	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 14	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 13 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 14 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 20	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 20 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 21 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 27	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 28	T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 07 04	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 05	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 11	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 12	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 11 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 12 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18	R	BDL	BDL	BDL	0.10 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 18	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 25	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 26	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 02	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 03	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 08 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 09 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988)   REGION: SOUTHWESTERN   LOCATION: WALLACEBURG (Cont'd)

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 08 15	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 16	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 08 29	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 30	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 09 12	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 13	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 12 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 13 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 26	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 09 27	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 10 11 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 12 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 12	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 10 13	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 07	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 08	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 14 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 15 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 21	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 22	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 28 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 28 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L   Type R - Raw   T - Treated   BDL - Below Detection Limit   NR - No Result   NS - No Sample   <T - A measurable trace amount: tentative
* - DWSP   ** - OMAF

ALCH - Alachlor
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DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: CENTRAL LOCATION: LINDSAY

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 19	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 19	T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 05 30	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 30	T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 08 08	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 08	T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 08 18	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 18	T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
88 08 26	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 26	T	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative
* - DWSP ** - OMAF

ALCH - Alachlor
AMET - Ametryne
ATRO - Atratone
ATRA - Atrazine
CYAN - Cyanazine
DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: WEST CENTRAL LOCATION: BRANTFORD

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 17	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 17	T	BDL	BDL	BDL	0.17 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 30 *	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 30 *	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 05 31	R	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 05 31	T	BDL	BDL	BDL	0.12 <T	BDL	0.25 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 14	R	BDL	BDL	BDL	0.16 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 14	T	BDL	BDL	BDL	0.20 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 27 *	R	BDL	BDL	BDL	0.22 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 27 *	T	BDL	BDL	BDL	0.24 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 28	R	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 28	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 07 25 *	R	BDL	BDL	BDL	0.10 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 25 *	T	BDL	BDL	BDL	0.10 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 26	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 26	T	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
88 08 29 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 29 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 27 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 27 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 24 *	R	BDL	BDL	BDL	0.30 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 24 *	T	BDL	BDL	BDL	0.52	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 28 *	R	BDL	BDL	BDL	0.23 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 11 28 *	T	BDL	BDL	BDL	0.31 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L Type R - Raw T - Treated BDL - Below Detection Limit NR - No Result NS - No Sample <T - A measurable trace amount: tentative

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ATRO - Atratone
ATRA - Atrazine
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DATRA - D-ethyl Atrazine
DSIM - D-ethyl Simazine
MET - Metolachlor
PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988)   REGION: WEST CENTRAL   LOCATION: CAYUGA

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 05 17	R	BDL	BDL	BDL	0.07 <T	BDL	NR	NS	BDL	BDL	BDL	BDL	BDL	BDL
88 05 17	T	BDL	BDL	BDL	0.10 <T	BDL	NR	NS	BDL	BDL	BDL	BDL	BDL	BDL
88 06 01	R	BDL	BDL	BDL	0.15 <T	BDL	0.28 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 01	T	BDL	BDL	BDL	0.15 <T	BDL	0.27 <T	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 06 *	R	BDL	BDL	BDL	BDL	BDL	NR	NS	BDL	BDL	BDL	BDL	BDL	BDL
88 06 06 *	T	BDL	BDL	BDL	BDL	BDL	NR	NS	BDL	BDL	BDL	BDL	BDL	BDL
88 06 14	R	BDL	BDL	BDL	0.24 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 14	T	BDL	BDL	BDL	0.19 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 28	R	BDL	BDL	BDL	0.41 <T	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 06 28	T	BDL	BDL	BDL	BDL	BDL	NR	NR	BDL	BDL	BDL	BDL	BDL	BDL
88 07 04 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 04 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 26	R	BDL	BDL	BDL	0.50	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 07 26	T	BDL	BDL	BDL	0.30 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 02 *	R	BDL	BDL	BDL	0.32 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 08 02 *	T	BDL	BDL	BDL	0.32 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 06 *	R	BDL	BDL	BDL	0.14 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 09 06 *	T	BDL	BDL	BDL	0.10 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 03 *	R	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 03 *	T	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 31 *	R	BDL	BDL	BDL	0.23 <T	BDL	0.38 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL
88 10 31 *	T	BDL	BDL	BDL	0.23 <T	BDL	0.36 <T	BDL	BDL	BDL	BDL	BDL	BDL	BDL

NOTE: Units = ug/L   Type R - Raw   T - Treated   BDL - Below Detection Limit   NR - No Result   NS - No Sample   <T - A measurable trace amount: tentative

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PROM - Prometone
PROY - Prometryne
PROP - Propazine
SENC - Sencor (Metribuzin)
SIM - Simazine

PESTICIDES IN ONTARIO SURFACE WATER SUPPLIES (1988) REGION: SOUTHEASTERN LOCATION: PLANTAGENET

YR MO DY	TYPE	ALCH	AMET	ATRO	ATRA	CYAN	DATRA	DSIM	MET	PROM	PROY	PROP	SENC	SIM
88 07 18	R	BDL	BDL	BDL	2.08	0.38 <T	0.94 <T	BDL	0.64 <T	BDL	BDL	BDL	BDL	BDL
88 07 18	T	BDL	BDL	BDL	1.44	0.22 <T	BDL	BDL	0.79 <T	BDL	BDL	BDL	BDL	BDL

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